FORM PTO 1390
(REV 11-98) U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: LAGROTH-025

U.S. APPLICATION NO. (If known, see 37 CFR 1 5): 09/890138

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATES	PRIORITY DATE CLAIMED
PCT/SE00/00186	31 January 2000	1 February 1999

TITLE OF INVENTION: METHOD AND ARRANGEMENT FOR THE CONTINUOUS MANUFACTURE OF PROFILED LIGNOCELLULOSE-CONTAINING BOARD OR STRIP-LIKE PRODUCTS

APPLICANT(S) FOR DO/EO/US: N. Lennart ERIKSSON, et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [X] This is an express request to promptly begin national examination procedures (35 U.S.C. 371 (f)).
4. [X] The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).
5. [X] A copy of the International Application as filed (35 U.S.C. 371 (c)(2))
   a. [ ] is attached hereto (required only if not transmitted by the International Bureau).
   b. [X] has been communicated by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [ ] An English language translation of the International Application as filed (35 U.S.C. 371 (c)(2)).
7. [X] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. [ ] are attached hereto (required only if not communicated by the International Bureau).
   b. [ ] have been communicated by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [X] have not been made and will not be made.
8. [ ] An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. [X] An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)). (Unexecuted)
10. [ ] An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. [X] An Information Disclosure Statement under 37 CFR 1.97 and 1.98. w/PTO-1449, 2 references
12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 & 3.31 is included.
13. [X] A FIRST preliminary amendment.
    [ ] A SECOND or SUBSEQUENT preliminary amendment.
14. [X] A substitute specification.
15. [ ] A change of power of attorney and/or address letter.
16. [X] Other items or information:

    Substitute Abstract
    Marked-up Specification
    Copy of International Application as published
    Copy of International Preliminary Examination Report
    One (1) Sheet Formal Drawing

EXPRESS MAIL LABEL NO. __EL807550830US_____
DATE: ____July 26, 2001_____

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/890138	PCT/SE00/00186	LAGROTH-025

17. [X] The following fees are submitted:

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) – (5)):

		CALCULATIONS PTO USE ONLY
[X]	Neither international preliminary examination fee (37 CFR 1 482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO . . .	$1,000.00
[ ]	International preliminary examination fee (37 CFR 1 482) not paid to USPTO but International Search Report prepared by the EPO or JPO . . .	$860 00
[ ]	International preliminary examination fee (37 CFR 1 482) not paid to USPTO but international search fee (37 CFR 1 445(a)(2)) paid to USPTO . . .	$710.00
[ ]	International preliminary examination fee paid to USPTO (37 CFR 1 482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) .	$690.00
[ ]	International preliminary examination fee paid to USPTO (37 CFR 1 482) and all claims satisfied provisions of PCT Article 33(1)-(4)	$100 00

ENTER APPROPRIATE BASIC FEE AMOUNT =	1,000.00	
Surcharge of $130.00 for furnishing the oath or declaration later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).		

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	*8- 20		x $18.00		
Independent claims	2- 3 =		x $80.00		
MULTIPLE DEPENDENT CLAIM(s) (if applicable)			+ $270.00		
TOTAL OF ABOVE CALCULATIONS =				1,000.00	
[ ] Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by ½.					
SUBTOTAL =				1,000.00	
Processing fee of $130.00 for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). +					
TOTAL NATIONAL FEE =				1,000.00	
Fee for recording the enclosed assignment (37 CFR 1.21 (h)). Assignment must be accompanied by appropriate cover sheet (37 CFR 3.28, 3.31) + ($40.00 per property).					
TOTAL FEES ENCLOSED =				1,000.00	
				Amount to be: Refunded	
				Charged	

*As In Preliminary Amendment

a. [ ] A check in the amount of _____ to cover the above fees is enclosed.

b. [X] Please charge my Deposit Account No. 12-1095 in the amount of $ 1,000.00 to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required or credit any overpayment to my Deposit Account No. 12-1095 . A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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600 South Avenue West
Westfield, NJ 07090
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Signature

ARNOLD H. KRUMHOLZ
Name

25,428
Registration Number

PATENT
LAGROTH 3.3-025

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of :
N. Lennart ERIKSSON *et al.* :
: Group Art Unit:
International Application No. :
PCT/SE00/00186 : Examiner:
:
International Filing Date: : Date: July 26, 2001
31 January 2000 :
:
For: METHOD AND ARRANGEMENT FOR THE :
CONTINUOUS MANUFACTURE OF PROFILED :
LIGNOCELLULOSE-CONTAINING BOARD OR :
STRIP-LIKE PRODUCTS :
X

Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Preliminary to initiation of the prosecution of the above-identified pending U.S. patent application, the following amendments and remarks are respectfully submitted.

IN THE ABSTRACT

Please delete the Abstract as filed and substitute therefor the attached revised Abstract.

IN THE SPECIFICATION

Please amend the Specification in accordance with the attached revised Specification.

IN THE CLAIMS

Please cancel claims 1-8 and add new claims 9-16.

9. (NEW) A method for continuously providing profiled lignocellulose-containing boards comprising providing a mat of disintegrated, dried and glue-coated lignocellulose-containing material, said mat including a pair of outer surfaces, providing at least one of said pair of outer surfaces of said mat with a predetermined surface profile, and pressing said mat into a board with a steam injection press while maintaining said

predetermined surface profile on said at least one outer surface of said board.

10. (NEW) The method of claim 9 including providing said mat having a bulk density of from 20 to 200 kg/m^3.

11. (NEW) The method of claim 9 including pre-compressing said mat while maintaining said predetermined surface profile of said at least one outer surface of said mat prior to said pressing step.

12. (NEW) The method of claim 9 including dividing said board into strip-like board products prior to said pressing step.

13. (NEW) The method of claim 9 including varying the density of said board across said at least one outer surface of said board.

14. (NEW) The method of claim 9 including providing said mat with a predetermined surface profile on both of said pair of outer surfaces of said mat.

15. (NEW) Apparatus for continuously providing profiled lignocellulose-containing boards from a mat of disintegrated, dried and glue-coated lignocellulose-containing material having a pair of outer surfaces, said apparatus comprising forming means for providing said mat with a predetermined surface profile on at least one of said pair of outer surfaces, and a steam injection press for pressing said profiled mat into a board, said steam injection press including at least one roll having a first surface profile across its width, and surface densifying means for increasing the density of said at least one surface of said board, said surface densifying means including at least one roll having a second surface profile across its width.

16. (NEW) The apparatus of claim 15 wherein said predetermined surface profile of said forming means corresponds to said first surface profile, and wherein said second surface profile has a diameter greater than that of said first surface profile at predetermined extreme points thereon.

REMARKS

The above-noted cancellation of claims 1-8, and addition of new claims 9-16, as well as the submission of a new Abstract and revisions to the Specification, are respectfully submitted prior to initiation of the prosecution of this application in the U.S. Patent and Trademark Office.

The above-noted new claims are respectfully submitted in order to more clearly and appropriately claim the subject matter which applicants consider to constitute their inventive contribution. No new matter is included in these amendments. In addition, the revisions to the Abstract and Specification are submitted in order to clarify and correct the Abstract and Specification and to conform them to all of the requirements of U.S. practice. No new matter is included in these amendments.

In view of the above, it is respectfully requested that these amendments now be entered, and that prosecution on the merits of this application now be initiated. If, however, for any reason the Examiner does not believe such action can be taken, it is respectfully requested that he telephone applicant's attorney at (908) 654-5000 in order to overcome any objections which he may have.

If there are any additional charges in connection with this requested amendment, the Examiner is authorized to charge applicant's Deposit Account No. 12-1095 therefor.

Respectfully submitted,

LERNER, DAVID, LITTENBERG,
KRUMHOLZ & MENTLIK, LLP

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METHOD AND ARRANGEMENT FOR THE CONTINUOUS MANUFACTURE OF PROFILED LIGNOCELLULOSE-CONTAINING BOARD OR STRIP-LIKE PRODUCTS

FIELD OF THE INVENTION

[0001] The present invention relates to a method of continuously producing profiled lignocellulose-containing board or strip-like products. More particularly, the present invention relates to apparatus for carrying out such a method.

[0002] A common way of producing profiled structural elements, such as skirting boards, cornices, window linings, architraving or furniture components and the like is to plane or mill the desired profile either from solid wood or from fiberboard, preferably MDF (Medium Density Fiberboard). The unsuitability of using this technique to mill such products from medium density fibreboard is obvious. Firstly, it would involve a production chain and transport chain consisting of many expensive intermediate steps and operations, and it would mean that the profiled product would have different cross-sectional densities and for that reason absorb different amounts of paint or varnish at discrete locations. The milling operation would also result in high material losses. For instance, more than 50% of the starting material can be lost when milling products to pronounced profile depths.

[0003] A standard example of this production chain may be as follows: Dried and glue-coated fibers are produced in the MDF plant and shaped into mats which are pressed into boards which are then edge-trimmed and ground. Losses are experienced in the form of edge trim and dust from the grinding operations. The next link in the production chain consists of transportation of board to the production unit for the profiled products. In the third link, the medium density fibreboards are sawed into strips which form the starting blanks for the profiled products, these starting blanks being milled and ground as well as lacquered with layers of paint or varnish or are coated with some type of film for priming or decoration purposes.

[0004] One object of the present invention is to avoid the drawbacks associated with the aforesaid production process in an economical fashion and, instead, to provide a continuous process up to the finished profiled product with as little material loss as possible.

SUMMARY OF THE INVENTION

[0005] In accordance with the present invention, this and other objects have now been realized by the invention of a method for continuously providing profiled lignocellulose-containing boards comprising providing a mat of disintegrated, dried and glue-coated lignocellulose-containing material, the mat including a pair of outer surfaces, providing at least one of the pair of outer surfaces of the mat with a predetermined surface profile, and pressing the mat into a board with a steam injection press while maintaining the predetermined surface profile on the at least one outer surface of the board. Preferably, the method includes providing the mat having a bulk density of from 20 to 200 kg/m^3.

[0006] In accordance with one embodiment of the method of the present invention, the method includes pre-compressing the mat while maintaining the predetermined surface profile of the at least one outer surface of the mat prior to the pressing step.

[0007] In accordance with another embodiment of the method of the present invention, the method includes dividing the board into strip-like board products prior to the pressing step.

[0008] In accordance with another embodiment of the method of the present invention, the method includes varying the density of the board across the at least one outer surface of the board.

[0009] In accordance with another embodiment of the method of the present invention, the method includes providing the mat with a predetermined surface profile on both of the pair of outer surfaces of the mat.

[0010] In accordance with the present invention, this and other objects have also been realized by the invention of apparatus for continuously providing profiled lignocellulose-containing boards from a mat of disintegrated, dried and glue-coated lignocellulose-containing material having a pair of outer surfaces, the apparatus comprising forming means for providing the mat with a predetermined surface profile on at least one of the pair of outer surfaces, and a steam injection press for pressing the profiled mat into a board, the steam injection press including at least one roll having a first surface profile across its width, and surface densifying means for increasing the density of the at least one surface of the board, the surface densifying means including at least one roll having a second surface profile across its width. In a preferred embodiment, the predetermined surface profile of the forming means corresponds to the first surface profile, and the second surface profile has a diameter greater than that of the first surface profile at predetermined extreme points thereon.

BRIEF DESCRIPTION OF THE DRAWING

[0011] The present invention will now be described in more detail with reference to the following detailed description which, in turn, refers to the accompanying drawing, in which:

[0012] The figure is a side, elevational, schematic, longitudinal section of a plant in accordance with the present invention, with four separate cross-sections shown in larger scale.

[0013] The plant shown in the drawing is based on the plant illustrated in Swedish Patent No. 502,272, which describes a continuous steam injection process. Disintegrated, dried and glue-coated lignocellulosic fiber material is delivered to a forming station 1 and there formed into a fiber mat 3 which is fed into a steam injection press 2. The fiber mat is pressed in the press into a board product 4 which is hardened, or cured, to an extent at which the board is solid and has a given mechanical strength. The surfaces are further densified

in a surface densifying unit 5. This process results in board that has a dense outer surface.

[0014] According to the present invention, the plant is designed for the production of profiled board or strip products in one and the same two-step process. To this end, a milling or cutting roll 6 is arranged between the forming station 1 and the steam injection press 2. The cutting roll 6 functions to impart a profiled surface structure to the lignocellulosic, glue-coated starting material in the form of the fiber mat 3 that has a density of between 20 and 200 kg/m^3. To this end, the diameter of the cutting roll 6 varies across its width. The profile imparted to the cross-section of the mat will substantially coincide with the cross-section of the finished product. The profiled mat 3, which may be precompressed, is transported continuously into the steam injection press 2. This press includes a profiled steam roll 7 that has the same profile as the cutting roll 6. The mat 3 is thus compressed therein and hardened to form a board or strip 4 that has the intended cross-section, by injecting saturated or superheated steam into the mat. The surface layers are further compressed in a second step, by allowing the board or the strip 4 to pass through the surface densifying unit 5 that includes one or more hot, compression roll-pairs 8 that have the same geometry as the steam roll 7, but a smaller cross-sectional area so as to obtain the desired surface compression. The surface temperature of the roll pairs 8 may lie between about 100 and 350°C, preferably between about 150 and 250°C.

[0015] The drawing shows the cross-section 9 of the formed fiber mat 3 prior to profiling the mat. The cross-section 10 downstream of the cutting roll 6 illustrates the profile of the upper surface. Downstream of the steam injection press 2, the board 4 pressed therein will have the cross-section 11, and the surface sheet in the cross-section 12 downstream of the surface densifying unit 5 will have a higher density, but the same profile.

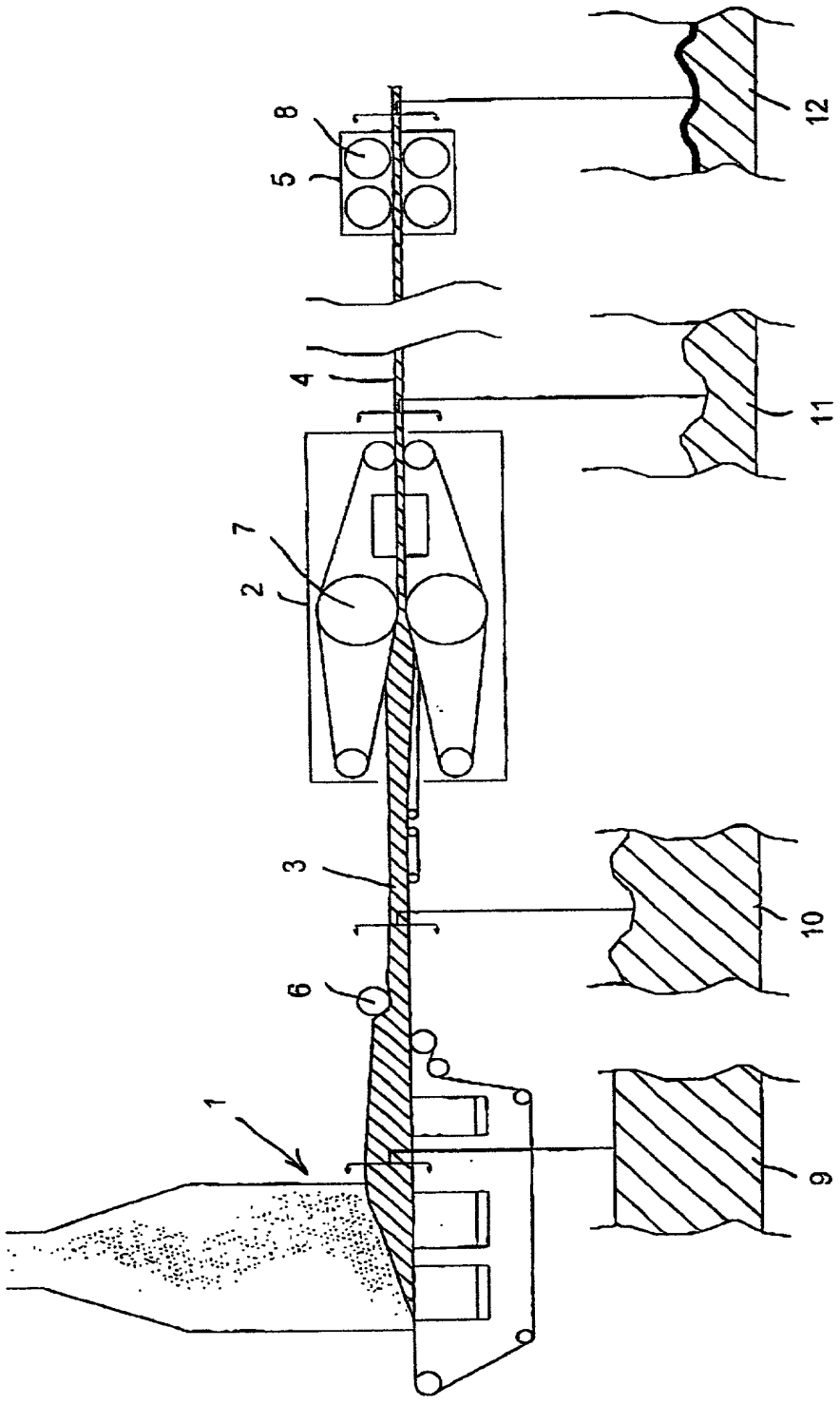
[0016] The underside of the board can be profiled with the same technique. In this respect, a cutting roll 6 is also arranged on the other side of the fiber mat 3 and the lower rolls, 7 and 8, in the steam injection press 2 and the surface densifying unit 5 are provided with the same surface profile as the lower cutting roll across the respective widths thereof.

[0017] It may be of interest in certain applications to provide certain parts of the profile with a greater density, e.g. on exposed tops. This is made possible by allowing the profile on the rolls, 7 and 8, to deviate from the profile on the cutting roll 6 at these points.

[0018] In one alternative embodiment, the board or the strip produced in the first step, i.e. in the steam injection press, can be divided into several narrower strips in a continuous process, these narrower strips are then being passed through one or more hot roll pairs 8 in the surface densifying unit 5. Separation of the board or strip into a plurality of strips may be effected by sawing, for example.

[0019] The present invention enables the production of profiled lignocellulose-containing products in the form of boards and strips of uniform density throughout the whole of their cross-section and with dense surfaces that absorb equal amounts of paint over the entire product in a rapid and continuous process. Furthermore, this is achieved in the absence of losses in starting material, apart from the small losses that occur when sawing the board or strip.

[0020] Although the invention herein has been described with reference to particular embodiments, it is to be understood that these embodiments are merely illustrative of the principles and applications of the present invention. It is therefore to be understood that numerous modifications may be made to the illustrative embodiments and that other arrangements may be devised without departing from the spirit and scope of the present invention as defined by the appended claims.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METHOD AND ARRANGEMENT FOR THE CONTINUOUS MANUFACTURE OF PROFILED LIGNOCELLULOSE-CONTAINING BOARD OR STRIP-LIKE PRODUCTS

FIELD OF THE INVENTION

[0001] The present invention relates to a method of continuously producing profiled lignocellulose-containing board or strip-like products. More particularly, the present invention relates to apparatus ~~according to the preamble of claim 1, and to an arrangement~~ for carrying out such a ~~the~~ method ~~in accordance with the preamble of claim 7~~.

[0002] A common way of producing~~, e.g.,~~ profiled structural elements, such as skirting boards, cornices, window linings, architraving or furniture components and the like is to plane or mill the desired profile either from solid wood or from fiberboard~~fibreboard~~, preferably MDF (Medium Density Fiberboard~~Fibreboard~~). The unsuitability of using this technique to mill such products from medium density fibreboard ~~fibreboard~~ is obvious. Firstly, it would involve a production chain and transport chain consisting of many expensive intermediate steps and operations, and it would mean that the profiled product would have different cross-sectional densities ~~in cross-section~~ and for that reason ~~therewith~~ absorb different amounts of paint or varnish at discrete locations. The milling operation would also result in high material losses. For instance, more than 50% of the starting material can be lost when milling products to pronounced profile depths.

[0003] A standard example of this production chain may be as follows: Dried and glue-coated fibers ~~fibres~~ are produced in the MDF plant and shaped into mats which are pressed into boards which are then edge-trimmed and ground. Losses are experienced in the form of edge trim and dust from the grinding operations. The next link in the production chain consists of ~~in the~~ transportation of board to the production unit for the profiled products. In the third link, the medium density fibreboards ~~fibreboards~~ are sawed ~~sawn~~ into strips

which form the starting blanks for the profiled products, these starting blanks being milled and ground as well as lacquered with layers of paint or varnish or are coated with some type of film for priming or decoration purposes.

[0004] One ~~The~~ object of the present invention is to avoid the drawbacks associated with the aforesaid production process in an economical fashion and, instead, to provide a continuous process up to the finished profiled product with as little material loss as possible. ~~This object is achieved in accordance with the invention having the characteristic features set forth in the following Claims.~~

SUMMARY OF THE INVENTION

[0005] In accordance with the present invention, this and other objects have now been realized by the invention of a method for continuously providing profiled lignocellulose-containing boards comprising providing a mat of disintegrated, dried and glue-coated lignocellulose-containing material, the mat including a pair of outer surfaces, providing at least one of the pair of outer surfaces of the mat with a predetermined surface profile, and pressing the mat into a board with a steam injection press while maintaining the predetermined surface profile on the at least one outer surface of the board. Preferably, the method includes providing the mat having a bulk density of from 20 to 200 kg/m^3.

[0006] In accordance with one embodiment of the method of the present invention, the method includes pre-compressing the mat while maintaining the predetermined surface profile of the at least one outer surface of the mat prior to the pressing step.

[0007] In accordance with another embodiment of the method of the present invention, the method includes dividing the board into strip-like board products prior to the pressing step.

[0008] In accordance with another embodiment of the method of the present invention, the method includes varying the

density of the board across the at least one outer surface of the board.

[0009] In accordance with another embodiment of the method of the present invention, the method includes providing the mat with a predetermined surface profile on both of the pair of outer surfaces of the mat.

[0010] In accordance with the present invention, this and other objects have also been realized by the invention of apparatus for continuously providing profiled lignocellulose-containing boards from a mat of disintegrated, dried and glue-coated lignocellulose-containing material having a pair of outer surfaces, the apparatus comprising forming means for providing the mat with a predetermined surface profile on at least one of the pair of outer surfaces, and a steam injection press for pressing the profiled mat into a board, the steam injection press including at least one roll having a first surface profile across its width, and surface densifying means for increasing the density of the at least one surface of the board, the surface densifying means including at least one roll having a second surface profile across its width. In a preferred embodiment, the predetermined surface profile of the forming means corresponds to the first surface profile, and the second surface profile has a diameter greater than that of the first surface profile at predetermined extreme points thereon.

BRIEF DESCRIPTION OF THE DRAWING

[0011] The present invention will now be described in more detail with reference to the following detailed description which, in turn, refers to the accompanying drawing, in which:

[0012] The figure is a side, elevational, schematic, ~~which illustrates schematically in~~ longitudinal section of a ~~an inventive~~ plant in accordance with the present invention, with four separate cross-sections shown in larger scale.

[0013] The ~~illustrated~~ plant shown in the drawing is based on the plant illustrated in Swedish Patent No. 502,272~~SE 502 272~~, which describes a continuous steam injection process.

Disintegrated, dried and glue-coated lignocellulosic fiber ~~fibre~~ material is delivered to a forming station 1 and there formed into a fiber ~~fibre~~ mat 3 which is fed into a steam injection press 2. The fiber ~~fibre~~ mat is pressed in the press into a board product 4 which is hardened, or cured, to an extent at which the board is solid and has a given mechanical strength. The surfaces are further densified in a surface densifying unit 5. This process results in board that has a dense outer surface.

[0014] According to the present invention, the plant is designed for the production of profiled board or strip products in one and the same two-step process. To this end, a milling or cutting roll 6 is arranged between the forming station 1 and the steam injection press 2. The cutting roll 6 functions to impart a profiled surface structure to the lignocellulosic, glue-coated starting material in the form of the fiber ~~fibre~~ mat 3 that has a density of between 20 and 200 kg/m^3. To this end, the diameter of the cutting roll 6 varies across its width. The profile imparted to the cross-section of the mat will substantially coincide ~~essentially~~ with the cross-section of the finished product. The profiled mat 3, which may be precompressed, is transported continuously into the steam injection press 2. This press includes a profiled steam roll 7 that has the same profile as the cutting roll 6. The mat 3 is thus compressed therein ~~here~~ and hardened to form a board or strip 4 that has the intended cross-section, by injecting saturated or superheated steam into the mat. The surface layers are further compressed in a second step, by allowing the board or the strip 4 to pass through the surface densifying unit 5 that includes one or more hot, compression roll-pairs 8 that have the same geometry as the steam roll 7, but a smaller cross-sectional area so as to obtain the desired surface compression. The surface temperature of the roll pairs 8 may lie between about 100 and 350°C, preferably between about 150 and 250°C.

[0015] The drawing shows the cross-section 9 of the formed fiber ~~fibre~~ mat 3 prior to profiling the mat. The cross-section 10 downstream of the cutting roll 6 illustrates the profile of the upper surface. Downstream of the steam injection press 2, the board 4 pressed therein will have the cross-section 11, and the surface sheet in the cross-section 12 downstream of the surface densifying unit 5 will have a higher density, but the same profile.

[0016] The underside of the board can be profiled with the same technique. In this respect, a cutting roll 6 is also arranged on the other side of the fiber ~~fibre~~ mat 3 and the lower rolls, 7 and 8, in the steam injection press 2 and the surface densifying unit 5 are provided with the same surface profile as the lower cutting roll across the respective widths thereof.

[0017] It may be of interest in certain applications to provide certain parts of the profile with a greater density, e.g. on exposed tops. This is made possible by allowing the profile on the rolls, 7 and 8, to deviate from the profile on the cutting roll 6 at these points.

[0018] In one alternative embodiment, the board or the strip produced in the first step, i.e. in the steam injection press, can be divided into several narrower strips in a continuous process, these narrower strips are then being passed through one or more hot roll pairs 8 in the surface densifying unit 5. Separation of the board or strip into a plurality of strips may be effected by sawing, for example~~instance~~.

[0019] The present invention enables the production of profiled lignocellulose-containing products in the form of boards and strips of uniform density throughout the whole of their cross-section and with dense surfaces that absorb equal amounts of paint over the entire product in a rapid and continuous process. Furthermore, this is achieved in the absence of losses in starting material, apart from the small losses that occur when sawing the board or strip.

[0020] Although the invention herein has been described with reference to particular embodiments, it is to be understood that these embodiments are merely illustrative of the principles and applications of the present invention. It is therefore to be understood that numerous modifications may be made to the illustrative embodiments and that other arrangements may be devised without departing from the spirit and scope of the present invention as defined by the appended claims.

318656_1.DOC

METHOD AND ARRANGEMENT FOR THE CONTINUOUS MANUFACTURE OF PROFILED LIGNOCELLULOSE-CONTAINING BOARD OR STRIP-LIKE PRODUCTS

The present invention relates to a method of continuously producing profiled lignocellulose-containing board or strip-like products according to the preamble of claim 1, and to an arrangement for carrying out the method in accordance with the preamble of claim 7.

A common way of producing, e.g., profiled structural elements such as skirting boards, cornices, window linings, architraving or furniture components is to plane or mill the desired profile either from solid wood or from fibreboard, preferably MDF (Medium Density Fibreboard). The unsuitability of using this technique to mill such products from medium density fibreboard is obvious. Firstly, it would involve a production chain and transport chain consisting of many expensive intermediate steps and operations and would mean that the profiled product would have different densities in cross-section and therewith absorb different amounts of paint or varnish at discrete locations. The milling operation would also result in high material losses. For instance, more than 50% of the starting material can be lost when milling products to pronounced profile depths.

A standard example of this production chain may be as follows: Dried and glue-coated fibres are produced in the MDF plant and shaped into mats which are pressed into boards which are then edge-trimmed and ground. Losses are experienced in the form of edge trim and dust from the grinding operations. The next link in the production chain consists in the transportation of board to the production unit for the profiled products. In the third link, the medium density fibreboards are sawn into strips which form the starting blanks for the profiled products, these starting blanks being milled and ground as well as lacquered with layers of paint or varnish or are coated with some type of film for priming or decoration purposes.

The object of the present invention is to avoid the drawbacks associated with the aforesaid production process in an economical fashion and, instead, to provide a continuous process up to the finished profiled product with as little mate-

rial loss as possible. This object is achieved in accordance with the invention having the characteristic features set forth in the following Claims.

The invention will now be described in more detail with reference to the accompanying drawing, which illustrates schematically in longitudinal section an inventive plant with four separate cross-sections shown in larger scale.

The illustrated plant is based on the plant illustrated in SE 502 272, which describes a continuous steam injection process. Disintegrated, dried and glue-coated lignocellulosic fibre material is delivered to a forming station 1 and there formed into a fibre mat 3 which is fed into a steam injection press 2. The fibre mat is pressed in the press into a board product 4 which is hardened, or cured, to an extent at which the board is solid and has a given mechanical strength. The surfaces are further densified in a surface densifying unit 5. This process results in board that has a dense outer surface.

According to the invention, the plant is designed for the production of profiled board or strip products in one and the same two-step process. To this end, a milling or cutting roll 6 is arranged between the forming station 1 and the steam injection press 2. The cutting roll 6 functions to impart a profiled surface structure to the lignocellulosic, glue-coated starting material in the form of the fibre mat 3 that has a density of between 20 and 200 kg/m^3. To this end, the diameter of the cutting roll 6 varies across its width. The profile imparted to the cross-section of the mat will coincide essentially with the cross-section of the finished product. The profiled mat 3, which may be precompressed, is transported continuously into the steam injection press 2. This press includes a profiled steam roll 7 that has the same profile as the cutting roll 6. The mat 3 is compressed here and hardened to form a board or strip 4 that has the intended cross-section, by injecting saturated or superheated steam into the mat. The surface layers are further compressed in a second step, by allowing the board or the strip 4 to pass through the surface densifying unit 5 that includes one or more hot, compression roll-pairs 8 that have the same geometry as the steam roll 7 but a smaller cross-sectional area so as to obtain the desired surface compression. The surface temperature of the roll pairs 8 may lie between 100 and 350°C, preferably between 150 and 250°C.

The drawing shows the cross-section 9 of the formed fibre mat 3 prior to profiling the mat. The cross-section 10 downstream of the cutting roll 6 illustrates the profile of the upper surface. Downstream of the steam injection press 2, the board 4 pressed therein will have the cross-section 11, and the surface sheet in the cross-section 12 downstream of the surface densifying unit 5 will have a higher density but the same profile.

The underside of the board can be profiled with the same technique. In this respect, a cutting roll 6 is also arranged on the other side of the fibre mat 3 and the lower rolls 7 and 8 in the steam injection press 2 and the surface densifying unit 5 are provided with the same surface profile as the lower cutting roll across the respective widths thereof.

It may be of interest in certain applications to provide certain parts of the profile with a greater density, e.g. on exposed tops. This is made possible by allowing the profile on the rolls 7 and 8 to deviate from the profile on the cutting roll 6 at these points.

In one alternative embodiment, the board or the strip produced in the first step, i.e. in the steam injection press, can be divided into several narrower strips in a continuous process, these narrower strips then being passed through one or more hot roll pairs 8 in the surface densifying unit 5. Separation of the board or strip into a plurality of strips may be effected by sawing, for instance.

The invention enables the production of profiled lignocellulose-containing products in the form of boards and strips of uniform density throughout the whole of their cross-section and with dense surfaces that absorb equal amounts of paint over the entire product in a rapid and continuous process. Furthermore, this is achieved in the absence of losses in starting material, apart from the small losses that occur when sawing the board or strip.

CLAIMS

1. A method of continuously manufacturing profiled lignocellulose-containing board or strip-like products, wherein lignocellulosic fibre material is disintegrated to a particle and/or fibre form and the particles or fibres then dried, glue-coated and formed into a fibre mat which is pressed in a steam injection press to produce board or a strip-like product (4), **characterized** in that prior to being pressed the fibre mat (3) is given a surface profile which is maintained during the steam injection process, whereupon the surface of the board or strip-like product is compressed.

2. A method according to claim 1, **characterized** in that the fibre mat is formed with a bulk density of between 20 and 200 kg/m^3.

3. A method according to claim 1 or 2, **characterized** in that the fibre mat is precompressed.

4. A method according to any one of claims 1 - 3, **characterized** in that the steam injected board or strip-like product is divided continuously into narrower strips prior to said surface compression.

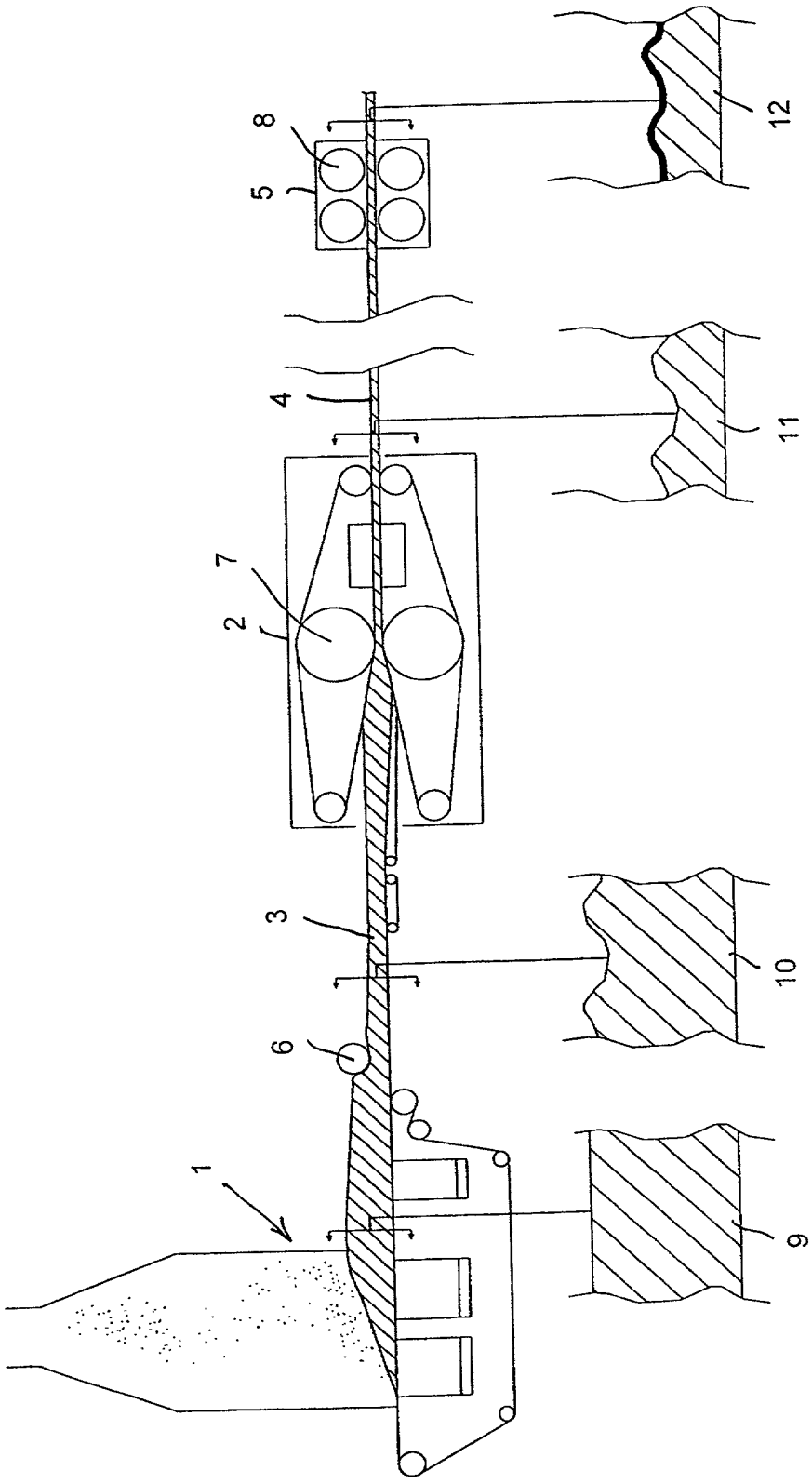
5. A method according to any one of claims 1 - 4, **characterized** in that the board or strip-like product is given a varying density across said surface.

6. A method according to any one of claims 1 - 5, **characterized** in that a surface profile is formed on both the top and bottom sides of the product.

7. Arrangement for applying the method according to any one of claims 1 - 6 and comprising a forming station (1), an injection press (2) for pressing a fibre mat (3) arriving from the forming station (1) into a board or strip-like product (4), and a surface densifying unit (5) for further treating said product, **characterized** in that at least one milling or cutting roll (6) is provided between the forming station (1)

and the steam injection press (2) for providing the fibre mat with a surface profile; and in that the steam injection press (2) and the surface densifying unit (5) are each provided with at least one roll (7 and 8 respectively) that are profiled across their width.

8. Arrangement according to claim 7, **characterized** in that the steam roll (7) in the steam injection press (2) has the same profile as the milling or cutting roll (6) whereas the press roll (8) in the surface densifying unit has a profile whose diameter is greater than that of the profile on the steam roll (7) at certain extreme points.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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION

ATTORNEY'S DOCKET NO.: LAGROTH-025

As a below-named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name;
I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: Method and Arrangement for the Continuous Manufacture of Profiled Lignocellulose-Containing Board or Strip-Like Products, the specification of which

☐ is attached hereto
☒ was filed on 31 January 2000 as United States Application Number or PCT International Application Number PCT/SE00/00186 and was amended on ___ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119(a)-(d) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate, or any PCT international application having a filing date before that of the application on which priority is claimed:

PRIOR FOREIGN APPLICATION(S)			
COUNTRY	APPLICATION NUMBER	DATE OF FILING (month, day, year)	PRIORITY CLAIMED
Sweden	9900331-1	Feb. 01, 1999	YES ☒ NO ☐
			YES ☐ NO ☐
			YES ☐ NO ☐
LISTING OF FOREIGN APPLICATIONS CONTINUED ON PAGE 3 HEREOF ☐ YES ☒ NO			

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below:

Application Number: ___ Filing Date: ___

Application Number: ___ Filing Date: ___

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s), or § 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

U.S. Parent Application Serial Number: ___ Parent Filing Date: ___ Parent Patent No.: ___

U.S. Parent Application Serial Number: ___ Parent Filing Date: ___ Parent Patent No.: ___

PCT Parent Number: ___ Parent Filing Date: ___

LISTING OF US APPLICATIONS CONTINUED ON PAGE 3 HEREOF: ☐ YES ☒ NO

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

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DECLARATION -- Page 2

ATTORNEY DOCKET NO. LAGROTH-025

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Third Inventor's signature _____ **Date** _____

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Fourth Inventor's signature _____ **Date** _____

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Fifth Inventor's signature _____ **Date** _____

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Full name of sixth joint inventor, if any (given name, family name): _____

Sixth Inventor's signature _____ **Date** _____

Residence: _____ Citizenship: _____

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Full name of seventh joint inventor, if any (given name, family name): _____

Seventh Inventor's signature _____ **Date** _____

Residence: _____ Citizenship: _____

Post Office Address: _____

Full name of eighth joint inventor, if any (given name, family name): _____

Eighth Inventor's signature _____ **Date** _____

Residence: _____ Citizenship: _____

Post Office Address: _____